

Exploration of Integrating 7S Management into Metalworking Practice Teaching

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Abstract: Metalworking practice is a basic practical course in universities. It enables students to form a concrete understanding of textbook knowledge and master operation methods of various mechanical product processing and equipment in a short time. Introducing the enterprise 7S management concept into the teaching management of metalworking practice can help teachers manage training classes well, and make the management of tools, materials, safety and practice procedures as well as resource conservation clear and standardized. Combined with the current situation of metalworking practice, this paper introduces 7S management into its teaching, standardizes the whole process of site management, forms a closed-loop responsibility system and establishes an inspection mechanism, so as to realize stable and sustainable operation of teaching sites.

Keywords: 7S management; Metalworking practice; Teaching path

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1. Introduction

Metalworking practice is an indispensable practical teaching link in the training of engineering talents in colleges and universities, serving as an important bridge connecting theoretical knowledge and engineering application ^[1]. It not only allows students to master basic processing skills such as turning, milling, grinding, bench work and welding, but also cultivates hands-on ability, innovative thinking and rigorous engineering literacy in a real engineering environment, and shapes the craftsmanship spirit of pursuing excellence and standardized operation, laying a solid foundation for subsequent professional study, graduation design and future career development ^[2].

Metalworking practice venues feature concentrated equipment, numerous tools and high operation risks, which are highly consistent with the connotation of 7S management. Sorting and Straightening realize fixed placement of tools and orderly storage of materials with unobstructed passages; Sweeping and Sanitizing keep equipment intact and the environment clean; Safety and Saving directly correspond to practice operation specifications and rational utilization of resources; Shaping guides students to consciously abide by disciplines and develop good habits. 7S management shares consistent goals and compatible demands with metalworking

practice in terms of site order, safety guarantee, teaching standardization and habit cultivation.

It is extremely necessary to promote 7S management in metalworking practice teaching^[3]. It can effectively eliminate potential safety hazards and reduce risks from equipment, cutting tools, electricity, and gas to protect the safety of teachers and students as well as equipment; optimize practice procedures and cut invalid time spent on searching for tools and tidying up clutter to improve training efficiency and teaching quality^[4]. Meanwhile, it helps students adapt to enterprise site management standards in advance, establish awareness of rules and responsibility and professional literacy, realize seamless connection between campus training and industrial site management, and comprehensively improve the quality of engineering talent training.

2. Existing problems in metalworking practice teaching and management

As an important link in engineering education practice, metalworking practice mainly consists of four core modules: training on traditional mechanical manufacturing processes, experience of numerical control manufacturing technology, cultivation of engineering literacy, and safety awareness education. Due to various objective and subjective factors, a series of problems exist in metalworking practice, even leading to safety accidents^[5]. The main problems are as follows: First, teaching resources and hardware facilities fail to be updated in a timely manner, with idle, waste equipment and uncleaned, unsanitary dead corners. Second, teaching and organizational management are chaotic, and rules and procedures exist in name only without clear assignment of responsibilities to specific personnel. Third, safety guarantees are inadequate and the learning environment for teachers and students needs further rectification. Fourth, teaching staff lack professional proficiency and standardized teaching procedures. In conclusion, metalworking practice features a large number of students, complicated equipment and numerous hidden dangers during use, bringing many key difficulties to teaching and management.

3. Connotation of the 7S management concept

The “7S” management system, which originated in Japan, is an on-site enterprise management framework. It delivers continuous improvements to seven core elements to boost corporate work efficiency, strengthen staff safety awareness, and cultivate good employee habits. The seven elements consist of Sort, Set in Order, Shine, Standardize, Sustain, Safety and Save. Sort means distinguishing necessary items from unnecessary ones and removing the latter to free up space. Set in Order refers to managing necessary items with fixed locations, fixed quantities and fixed labeling standards to ensure easy access, easy storage and easy management, thus cutting down time spent searching for items. Shine involves wiping away dust, oil stains, garbage and other dirt to maintain spotless floors^[6]. Standardize institutionalizes and standardizes the results achieved through the previous three steps to prevent the workplace from slipping back into disarray. Sustain trains employees to voluntarily comply with the 7S standards, shifting their mindset from passive compliance to active maintenance. Safety requires timely identification of on-site hazards, establishment of prevention and emergency response mechanisms, and elimination of safety accidents. Save focuses on optimizing resource utilization, cutting waste and achieving cost reduction and efficiency improvement. Introducing the 7S system into metalworking practice teaching essentially creates a safe and well-organized teaching environment via systematic approaches, and enhances students’ awareness of rules and safety.

4. Feasible schemes of applying 7S management in metalworking practice teaching and management

4.1. Mandatory implementation and comprehensive standardization

(1) Establish Organizational Structure

To ensure the long-term smooth operation of the 7S management system in experimental teaching and management, a 7S promotion team shall be set up in the first place, which takes overall charge of formulating 7S management regulations, organizing implementation, arranging supervision and carrying out improvements. The team shall be granted corresponding authority, including the formulation of detailed rules, organization of implementation, and supervision of rectification, to guarantee rigid execution capacity, promote standardization and refinement of the 7S management system, and finally realize closed-loop 7S management.

(2) Formulate Standards

To systematically promote 7S management in training centers, it is necessary to compile regulations including 7S Evaluation Criteria, 7 Assessment Methods, 7S Evaluation Records, training standards, evaluation indicators and daily student codes of conduct. Defining placement positions and storage quantity standards of articles and tools is an efficient way to standardize management and facilitate access. Uniform marking lines, article labels, warning signs and status display boards shall be adopted as visual management tools to make on-site conditions clear at a glance, facilitating safety inspection and abnormality detection. The above schemes provide a clear basis for subsequent standard implementation to ensure operability and assessability of 7S standards ^[7].

(3) Full Implementation and Assessment

A responsibility system must be established to guarantee long-term stable implementation of 7S management, clarifying the scope of duties, roles and tasks of every faculty member in 7S work. A core team proficient in standards and with strong execution capacity shall be formed to guide all training teachers and students. The team shall conduct regular inspections and revise management regulations accordingly. In line with the objectives and principles of 7S management, an evaluation system shall be set up with scoring based on inspection results. Rewards shall be given to faculty members with outstanding 7S performance to motivate all staff to implement management measures ^[8].

(4) Integrate into the Whole Metalworking Practice Teaching Process

To cultivate students' professional literacy and help them understand real enterprise management scenarios, the key is to internalize daily standardized management into their professional habits. During safety training, irrelevant articles shall be sorted out, in addition to emphasizing safety precautions. After finishing each processing type, teachers shall supervise students to clean up all generated waste. Wearing standard protective clothing shall be inspected and included in attendance assessment, and the importance of resource conservation shall be stressed to reduce leftover materials and avoid equipment wear. Only in this way can students develop awareness of conservation, rules and safety and form good professional habits to prepare for future enterprise employment ^[9].

4.2. Deep integration and cultural cultivation

(1) Systematic Integration

To maintain steady optimization of 7S management in university training centers, continuous systematic integration shall be promoted. The training center shall take the lead in organically integrating 7S standards,

school management systems, metalworking practice specifications, and equipment maintenance requirements, coordinating multiple departments to break institutional barriers, sort out cross-link procedures, and build a unified responsibility system. The evaluation and rectification links of 7S shall be deeply integrated into daily teaching to form a multi-system collaborative operation mode.

(2) Incentive Mechanism and Result Solidification

Multi-channel incentive mechanisms shall be established to boost innovation in 7S metalworking teaching. Faculty members with enterprise work experience are encouraged to compile innovative schemes targeting difficulties encountered in daily training, while students are invited to put forward reasonable suggestions on 7S-related problems. Rewards shall be set and the adoption rate of suggestions and problem-solving innovations shall be included in year-end assessments. Meanwhile, effective verified innovative practices shall be summarized and standardized to revise documents including 7S Evaluation Criteria, 7 Assessment Methods, 7S Evaluation Records, training standards and student codes, compile training materials, avoid short-lived improvement and steadily elevate training teaching quality.

4.3. Expected effects of applying the 7S management concept

- (1) Improve the image of the Engineering Training Center among students. The implementation of 7S management helps build a tidy, clean and well-organized learning environment, boosting students' favorable impression of the center. It also creates a positive impression during visits, study exchanges and inspections by other institutions, raising the university's reputation ^[10].
- (2) Boost students' learning efficiency. A pleasant learning environment and atmosphere with neatly arranged supplies allow students to focus on their studies quickly. Free from the clutter of redundant items and tools, students can concentrate better on learning.
- (3) Cut unnecessary waste in all aspects. It reduces waste related to space, raw materials, consumables, electricity and manpower, making full use of limited time. Quantified consumables support students in creating more diverse work, thus lowering the university's operating costs.
- (4) Lower equipment failure rates and tool loss incidents. Regular cleaning and inspection by trained instructors continuously maintain a clean learning environment. Routine machine upkeep keeps equipment running properly and extends its service life, while also preventing frequent loss of tools.
- (5) Reduce the occurrence of accidents. A safe training environment is established with a clear on-site layout, all items stored in designated positions, spacious and bright training areas, unobstructed walkways, and no random stacking of irrelevant objects on the ground ^[11]. Safety operation standards for each workstation are emphasized before training sessions, and instructors provide on-site guidance and supervision throughout the training. Such orderly training activities can effectively curb accidents.

5. Conclusion

Metalworking practice is a key link of engineering education in universities, and its teaching quality determines the effectiveness of talent training. Introducing enterprise 7S management into metalworking practice teaching is not simple copying or environmental cleaning, but a transformation from experience-based teaching management to standard-based management. Through mandatory reform, standard formulation, responsibility implementation, and reward & punishment assessment, hidden safety hazards, idle resources, time waste, and loose management can be solved. Systematic integration, incentive innovation and result

solidification sustain the optimization of such reforms. Introducing the 7S management concept can not only provide teachers and students with a safe, orderly and efficient teaching environment, but also cultivate students' sense of responsibility and craftsmanship spirit, offering solid support for them to become high-quality talents in enterprises in the future.

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